

Notes - Complex Numbers

$$a + bi$$

↓ ↓
real imaginary component

$$i = \sqrt{-1}$$

$$\text{or } i^2 = -1$$

$$\text{Ex: } \sqrt{-25} = 5i$$

- Add & Subtract \Rightarrow just treat i like any other variable
- Multiplying \Rightarrow when you get i^2 , make $i^2 = -1$ and keep simplifying

- Division \Rightarrow Use the complex conjugate

↳ change the sign in the middle

Ex:
$$\frac{5}{(2+3i)} \cdot \frac{2-3i}{(2-3i)} = \frac{10-15i}{4-9i^2} = \frac{10-15i}{4-9(-1)} = \boxed{\frac{10-15i}{13}}$$

2	3i
4	6i
-3i	-9i ²

- Powers of $i \Rightarrow$ Look for $i^2 (= -1)$ or $i^4 (= 1)$

• Only 4 answers possible $\underbrace{i, -i}_{\text{odd}}, \underbrace{1, -1}_{\text{even}}$

Even:

$$i^{12} = (i^4)^3 = (1)^3 = 1$$
$$i^{30} = (i^2)^{15} = (-1)^{15} = -1$$

Odd:

$$i^{25} = i \cdot i^{24} = i (i^4)^6 = i (1)^6 = i$$
$$i (i^2)^{12} = i (-1)^{12} = i$$